

**THE CLOCK IS TICKING: USING
RUN-TIMING GENES TO RESCUE FEATHER
RIVER SPRING-RUN AS CLIMATE WARMS**

#0077

Technical Panel Review

Proposal Name: THE CLOCK IS TICKING: USING RUN-TIMING GENES TO RESCUE FEATHER RIVER SPRING-RUN AS CLIMATE WARMS

Applicant Organization: Oregon State University

Principal Lead Investigator(s):

Banks, Michael

Bucklin, Katherine

Amount Requested: \$597,461

TSP Panel Summary of Findings:

The panel and the external reviewers unanimously rated this project Above Average. This innovative approach is only recently available for field testing, and is a fundamentally useful model that could be used in other areas. This seems like a worthwhile question to explore, and this strong research team has submitted an appropriate budget. The panel determined that contribution of the basic findings to other anadromous species elevates it above the merely sufficient category. However, the actual methodological design was confusing (e.g. how do tasks 1-5 fit w. Table A-G). Finally, this seems like somewhat basic research and the direct links to this PSP and management are lacking. Based on these reservations, the panel was not confident that the project proponents could deliver what they are describing.

Relevance to PSP Topic Areas:

Low

TSP Technical Rating:

Above Average

TSP Funding Recommendation:

Do Not Fund

TSP Amount Recommended: \$0

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Technical Panel Review

Conditions:

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External Technical Review #1

Proposal Title: THE CLOCK IS TICKING: USING RUN-TIMING GENES TO RESCUE FEATHER RIVER SPRING-RUN AS CLIMATE WARMS

Proposal Number: 0077

Proposal Applicant: Oregon State University

Purpose

Comments	<p>This proposal is generally well-written, and the authors present a convincing argument that little data is available to determine whether spring-run Chinook salmon really exist any more in some streams, or whether their traits have been assimilated into the fall-runs due to hybridization. As such, they propose to investigate: 1) differences in genes of the Clock family using microsatellites to ascertain whether run differences can be discriminated; 2) whether these markers are heritable; and 3) how this information can be used for breeding choices. The first 2 purposes are worthwhile, are within the scope of this proposal, and will certainly add to our base of our knowledge. The third purpose, management strategies, is not described at all and is really a large shortcoming of the proposal. The other issue that is not addressed, and is seemingly inconsistent with the title and hypothesis, is what characteristics spring-run fish would have to help them deal with increasing climatic temperatures and other types of changing environmental pressures. The authors state that because of temperature increases and habitat changes in many of the rivers, spring-run populations are either extinct or their numbers are diminished. Obviously, reducing the loss of traits is a laudable goal. But there is nothing that suggests that preserving these traits will work in light of increasing temperatures.</p>
Rating	Sufficient

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Background

Comments	<p>The authors do a good job of providing adequate background information to demonstrate that there is a loss of spring-run salmon, and that CLOCK gene family members may controlling run timing.</p> <p>There is a conceptual model included, and although it does show the general basis for the work, is very basic and doesn't take into account the other family members, how the investigators will determine which or the 4 genes associates most with run timing, and what the likely outcomes will be.</p>
Rating	Above Average

Approach

Comments	<p>The investigators clearly have the background knowledge and skills to conduct the proposed study. However, there is very little preliminary data actually shown in a graphical or tabular format to demonstrate that they can distinguish loci between spring and fall-runs. This information is just presented in the text, which makes it extremely hard to evaluate the likelihood of success. The authors state that some of this data is shown in figures 4 and 5, but these are not in the proposal.</p> <p>In rainbow trout, 50% of the spawning variance can be explained by the CLOCK gene. What explains the rest of the variance?</p> <p>Table 1 is confusing, because Task 1, 2, etc in the text do not match up with Task A, B, etc in the table. But, based upon the investigators' record, they will be able to meet at least 2 of the 3 objectives for the proposal.</p>
Rating	

External Technical Review #1

	Sufficient
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Feasibility

Comments	The scale of the project is consistent with the authors' previous endeavors. The authors have access to the appropriate equipment, facilities, and collaborators to ensure technical feasibility of the project, and are well qualified to conduct the proposed study. The management strategy is rather vague, such that it is hard to tell who is responsible for which aspects of the project.
Rating	Above Average

Budget

Comments	The budget is reasonable and adequate for the work proposed.
Rating	Superior

Relevance To CALFED

Comments	The proposed work is directly relevant to Topics 3 and 4 of the PSP, to investigate patterns of population responses to a changing environment. The authors will make use of archived genetic material to assign parental genotype, such that they can examine the parents and progeny from several years. This greatly adds to the power of their work. The question remains as to how they authors propose that they themselves, or resource managers, will be able to use their data.
Rating	Above Average

Qualifications

Comments	The investigators are well qualified to conduct the work, and have the necessary infrastructure to achieve the goals.
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External Technical Review #1

Rating	Superior
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Overall Evaluation Summary Rating

Comments	Determining genetic differences in spawn run-timing is definitely a worthwhile goal. The likelihood that it will succeed, due to the infrastructure and investigator qualifications, places this proposal in the "superior" category. However, the preliminary data was not provided to show that this strategy will work to distinguish spring and fall runs. That lowers the rating of the proposal. Additionally, the lack of information provided for how this knowledge would benefit resource managers, or any type of strategy that could potentially be used to preserve the spring-runs, also lowers the rating between "sufficient" and "above average".
Rating	Above Average

External Technical Review #2

Proposal Title: THE CLOCK IS TICKING: USING RUN-TIMING GENES TO RESCUE FEATHER RIVER SPRING-RUN AS CLIMATE WARMS

Proposal Number: 0077

Proposal Applicant: Oregon State University

Purpose

Comments	The goals of the study, to better understand the genetic underpinnings of migration and spawning timing, and to better classify chinook by their temporal run, are important and interesting. This is cutting edge research but not so far out that it does not have a good chance of success. I would classify it as innovative and likely to advance both information and methodologies. The hypotheses are clear.
Rating	Superior

Background

Comments	There is a conceptual model that is well-explained. There is some ambiguity regarding a key distinction. The term "run timing" is used but it is important to distinguish between migration and spawning date. Experimental studies on the genetic control of these events in various salmonid species should have been referenced, and the distinction between migration and spawning is especially important in spring and fall chinook. In addition, the connection to juvenile life history (i.e., stream and ocean type) should have been mentioned.
Rating	Sufficient

External Technical Review #2

Approach

Comments	The overall approach seems very sound, and the study takes advantage of sampling that has already been conducted. It is not clear, however, who will be doing the work. The proposal's title page lists Katherine Buckland as the lead but there seems to be no c.v. for her, even though she gets a large fraction of the budget. A "faculty research associate" named Renee Bellinger also gets a large fraction of the budget but again, there is no c.v. for her. The only c.v. is for Michael Banks, and he requests no salary. So, I am not sure who will be doing what. Otherwise, the work seems do-able to the best of my knowledge.
Rating	Above Average

Feasibility

Comments	This work is getting to the edges of my expertise but I think it is technically feasible and likely to succeed.
Rating	Superior

Budget

Comments	The budget is not very helpful. In addition to the ambiguity of the personnel, mentioned above, there are some suspiciously round numbers. \$50K for "expendable supplies and equipment" and \$10K for travel caught my eye. Maybe this is a "best professional guess" but it does not indicate a lot of attention to detail on the budget.
Rating	Sufficient

Relevance To CALFED

Comments	This is work that some might call a bit academic (maybe suitable for NSF) but I see real relevance to
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External Technical Review #2

	applied problems. The development of a good marker for seasonal runs of salmon, especially if it could be applied to runs elsewhere, would be a big triumph. In terms of the project itself, I am quite excited. My only reservations, however, hinge on the dismal status of the populations involved. Are we trying to preserve salmon life history patterns that are no longer suitable for the present, much less the future of California? Where is all this going?
Rating	Above Average

Qualifications

Comments	Michael Banks is a well-respected and accomplished young geneticist with expertise in (but not limited to) salmon. I am not familiar with the other staff and, unless I missed them, their c.v.s were not included.
Rating	Above Average

Overall Evaluation Summary Rating

Comments	This is a really exciting set of ideas. I have some reservations about the proposal as it has been presented but much if not all of them might be addressed in a revision. I think this has the potential to make some major advances in our knowledge of key aspects of salmon population structure.
Rating	Above Average

External Technical Review #3

Proposal Title: THE CLOCK IS TICKING: USING RUN-TIMING GENES TO RESCUE FEATHER RIVER SPRING-RUN AS CLIMATE WARMS

Proposal Number: 0077

Proposal Applicant: Oregon State University

Purpose

Comments	<p>This proposal takes an interesting and important approach to the conservation of Chinook salmon. The goals of this research are laudible, but the proposal was difficult to evaluate. This is in part due to my lack of familiarity with this particular system. Even in providing background, it is not clear which ESUs are being considered. I actually went to the web to find a map of the general study area which helped.</p> <p>This idea appears to be timely, especially due to the fact that a slight change in temperature could be important for the conservation of this species. Thus, identifying genes involved in run timing is important.</p> <p>The researchers have already developed markers that should be suitable to the question at hand, which is to evaluate the percentage of fish that have spring-run associated marker genes and the degree of heritability of for run-timing.</p> <p>The selection of this project seems justified. However, I have some concerns related to the preparation of the proposal. An excellent proposal would have addressed a number of problems. For instance, the number of microsatellites associated with each specific gene is not always clear. My understanding is that the researchers will evaluate 25 markers; 6 from CLOCK, a few from CRYPTOCHROME, 3 from BMAL, which leaves one to wonder where the other</p>
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External Technical Review #3

	<p>markers will be identified. Secondly, they have apparently developed and applied other markers that are presumably neutral and it is this second set that will be used for parentage assignment. Although they infer that there is sufficient power the specifics on the variation for each locus does not resolve this issue. A simple table would have helped resolve these uncertainties for both sets of markers (Clock genes and neutral).</p> <p>The results will probably add to the knowledge base.</p> <p>The project could generate novel information in that this is presumably the first attempt to evaluate run timing genes in salmon. This has relevance to many anadromous species.</p>
Rating	Above Average

Background

Comments	The general conceptual model is fine. However, the proposal is not well assembled and leaves the reviewer to make a number of best guesses (see above).
Rating	Sufficient

Approach

Comments	<p>The Approach appears to be well designed, but the work-load does seem a little ambitious, even with high through-put capacity. Again a good proposal would have provided a little more information on the time line for further optimization and would have perhaps suggested potential limitations.</p> <p>The administration of the proposal is straight-forward.</p> <p>I suspect that this project will result in peer-reviewed manuscripts.</p>
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External Technical Review #3

	Contributions to a larger data management system are only mentioned in the context of on-going monitoring program. This may be sufficient.
Rating	Above Average

Feasibility

Comments	<p>The work was not fully documented, see comments above. It is a plus that the workers have much preliminary data. However, a lack of documentation in the grant makes it hard to evaluate if all of the markers are ready. If the markers are ready, then the likelihood of success is much higher. If not, optimization time may be significant.</p> <p>The scale may be fine (see above).</p>
Rating	Above Average

Budget

Comments	The budget seems reasonable.
Rating	Superior

Relevance To CALFED

Comments	<p>This proposal is best suited to the following focal research topic:</p> <p>1) Trends and Patterns of Populations and System Response to a Changing Environment</p>
Rating	Superior

Qualifications

Comments	The authors appear to have a good track record. The infrastructure is good.
Rating	Superior

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External Technical Review #3

Overall Evaluation Summary Rating

Comments	This is an interesting project. I was most concerned with the lack of detail in the proposal. Thus, reviewing this proposal was not a trivial task.
Rating	Above Average